

LAKE WACCAMAW STATE PARK AQUATIC INVENTORY

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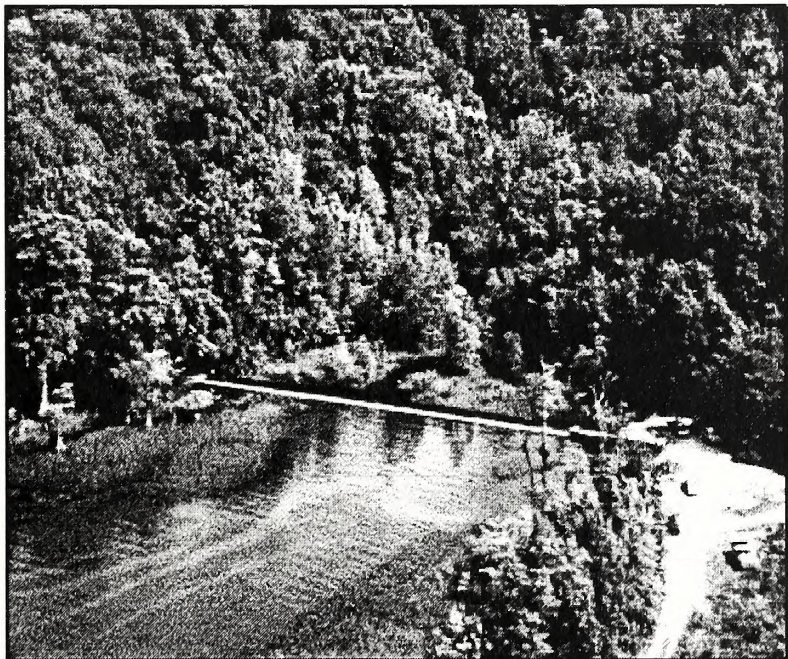


**LAKE WACCAMAW STATE PARK
AQUATIC INVENTORY**

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Lake Waccamaw



Start of Waccamaw River @ Lake Wacc. Dam

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Lake Waccamaw State Park Aquatic Inventory

Introduction

Lake Waccamaw State Park is in Columbus County and encompasses 1, 732 acres. Before the land became a park, it was used primarily for logging and shingle transportation, until these became rail based. In the early 1800s legislation provided that any lake that was 500 acres or more in Bladen, Columbus, or Cumberland counties was to become property of the state. Then, in October 1964, the Board of Conservation and Development began negotiations to try to procure land for a state park. Land purchases were made in the late 70s and mid-80s, to bring the state park to its present size. Lake Waccamaw State Park was opened for public use in 1976.

Within the park is the bay lake, Waccamaw. Bay lakes are concentrated in the Southeastern United States and are elliptical or oval depressions. They are referred to as bays because of the sweet, loblolly, and red bay that are found growing around them. There are approximately 500,000 bay lakes in the United States. Most of these lakes are filled with wet organic soils and are overgrown with vegetation. There are a few relic lakes that remain. Lake Waccamaw is probably the most unique of these lakes in North Carolina. Most Carolina bays are small, approximately 500 feet in length, but Lake Waccamaw encompasses 9,000 acres and has a 14 mile shoreline. The water level fluctuation of Lake Waccamaw is not due directly to precipitation, unlike other Carolina bays, but due to the Friar Swamp Drainage. The Carolina bays generally have a high level of acidity, but limestone bluffs on the north shore of Lake Waccamaw provide for a more neutral environment and consequently, for a wide variety of aquatic species.

The purpose of this project was to survey for aquatic species, including crayfish, fish, snails, mussels, and sphaeriid clams. Our inventory included Lake Waccamaw and the Waccamaw River Basin. Figure 1 details the localities of all stations surveyed. The following sections provide information on the species in the above taxa documented at each site in the survey area.

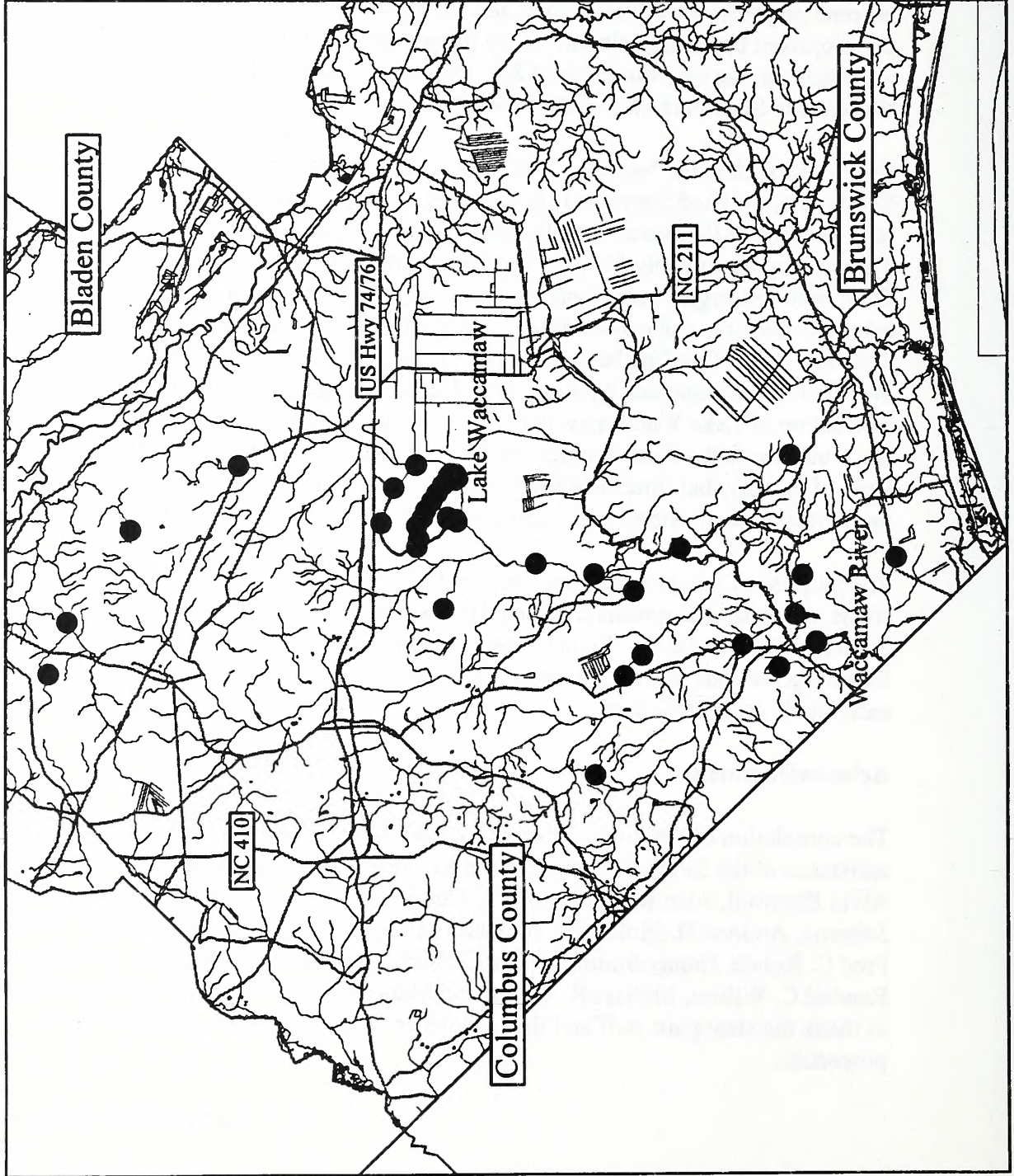
Acknowledgments

The completion of this project would not have been possible without the invaluable assistance of the following people: John M. Alderman, Art Bogan, Keith W. Ashley, Alvin Braswell, Alan R. Clark, John E. Cooper, Tom Henson, Paul E. Hoyle, Judith A. Johnson, Andrew H. McDaniel, Jr., Chris McGrath, Mary L. Moser, Louis P. Polletta, Fred C. Rohde, Danny Smith, Wayne C. Starnes, Jessie L. Taylor, Ken R. Taylor, Randall C. Wilson, Melissa R. Wood, and Mara Savacool Zimmerman. I would also like to thank the state park staff and the landowners who allowed us to work on their properties.

Gabriela B. Mottes

LAKE WACCAMAW STATE PARK AQUATIC INVENTORY

Figure 1.



Aquatic Snails

Introduction

There are approximately 500 species of aquatic snails currently recognized in North America. These 500 species are divided into 78 genera and 15 families (Burch 1989). In North Carolina, there are approximately 52 species representing 8 families (Adams 1990).

Snails are grouped into one of two subclasses. Prosobranch snails are gill-breathing and have an operculum, which is a calcareous plate that closes the aperture when the snail withdraws into its shell. Pulmonate snails are lung-breathing and do not have an operculum to seal their aperture (Burch 1989).

These animals graze on algae and other microscopic organisms using radular teeth to grind food to an appropriate size for consumption. Snails are an essential part of aquatic ecosystems, as well as indicators of water quality. However, they are typically overlooked. The lack of information and knowledge of snails can be attributed, in part, to their minute size, perceived lack of activity, cryptic habits, and difficulty in identification.

Methods

Study areas for this project included the aquatic habitats associated with Lake Waccamaw State Park (Fig. 1, Introduction Section). The substrate of the lake ranged from sand to muck bottom and back to sand as one moves east across the lake. There was minimal woody debris and leaf litter. The hardwood/pine/cypress buffer around the lake was fair to good. The pH of the lake ranged from 5.3 - 7.7. The predominant habitat within the Waccamaw River Basin was pool with some areas providing riffle and run habitat and having sand/silt/woody debris and leaf litter as the substrate. Certain tributaries of the river were swampy with abundant aquatic vegetation. A majority of the basin contained a fair to good hardwood/pine/cypress buffer and a minimal amount of aquatic vegetation. The pH for the basin ranged from 4.1 - 7.1.

Snails were collected in Lake Waccamaw and in the Waccamaw River Basin (Fig. 1). Various collecting techniques were utilized including SCUBA, snorkeling, and visual and tactile searches. Due to the cryptic habits of some snail species, it was necessary to sift and dredge the substrate. All available habitats were sampled. Snails were preserved and stored in 70% ethanol.

Snails and limpet snails were identified using Burch (1989) and Basch (1963). Expected distributions and the following characteristics were used to identify the specimens: presence/absence of an operculum, direction of coiling, shell size, shape, color and thickness, texture of the shell, placement of apex, shape and number of the whorls, and

the shape of the apertural lip. With the acquisition of additional information, identifications may be subject to change.

Results and Discussion

Snails were located at thirty-three of the sites surveyed (Fig. 1). At least nine species representing six families and both subclasses were found within the waterways associated with Lake Waccamaw State Park (Table 1).

Campeloma decisum (Say, 1816), *Lioplax subcarinata* (Say, 1816), *Pseudosuccinea columella* (Say, 1817), *Physella* sp., and *Helisoma anceps* (Menke, 1830) were collected in the backwater areas with slow flow in the silt/sand substrate. *Helisoma anceps*, *Pseudosuccinea columella*, and *Physella* sp. were also found in the aquatic vegetation, along with *Menetus dilatatus* (Gould, 1841). *Campeloma decisum* and *Lioplax subcarinata* were also found in the muck substrate.

Campeloma decisum is considered a species complex (Adams, pers. comm. 1995). Therefore, when more information is acquired, this species complex may be separated into a few recognizable species.

Gillia altilis (I. Lea, 1841) was found in the silt/sand/muck substrate and on aquatic vegetation. The limpet snails, *Ferrissia fragilis* (Tryon, 1863) and *Laevapex fuscus* (C.B. Adams, 1841) were found on the underside of the leaves of the aquatic vegetation and on rocks and woody debris in the slower current.

In 1985, Dr. Hugh Porter completed a survey of the molluscan fauna of Lake Waccamaw. Samples for this survey were taken at quarter-year intervals throughout 1979-1980 from sites randomly chosen in each of the lake's benthic regions (shallow sand, intermediate sand, deep sand, and muck). Some nonquantitative sampling was completed on Big Creek and the Waccamaw River. Dr. Porter's survey discovered the following species which our survey did not detect: *Amnicola* sp., *Planorbella trivolvis* (Say, 1817), and *Menetus alabamensis* (Pilsbry, 1895).

In an effort to try to duplicate, on a minimal scale, some of Dr. Porter's work, we inventoried transects running east across the lake. We felt that this would provide a good representative sample of the various habitats that Dr. Porter had chosen to survey. The transects were approximately 100 yards apart, closer to the shore, and approximately 300 yards apart closer to the center of the lake. Each transect contained 11 quadrats and an area of 0.25m² was sifted within each quadrat. Mesh baskets, with a mesh size of 3 mm, were used to sift the substrate. Our survey detected *Pseudosuccinea columella*, *Physella* sp. and *Menetus dilatatus*, which were not found by Dr. Porter. All of the other species which we found were also detected by Dr. Porter.

The waterways associated with Lake Waccamaw State Park support a good abundance and diversity of snails. As is shown in Table 2, most species were found in good numbers at each site.

Resources

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Table 1. Snails found in the waterways associated with Lake Waccamaw State Park

Prosobranchia

Hydrobiidae

Gillia altilis (I. Lea, 1841)

Buffalo pebblesnail

Viviparidae

Campeloma decisum (Say, 1816)

Pointed campeloma

Lioplax subcarinata (Say, 1816)

Ridged lioplax

Pulmonata

Lymnaeidae

Pseudosuccinea columella (Say, 1817)

Mimic lymnaea

Physidae

Physella sp.

Planorbidae

Helisoma anceps (Menke, 1830)

Two-ridge rams-horn

Menetus dilatatus (Gould, 1841)

Bugle sprite

Ancylidae

Ferrissia fragilis (Tryon, 1863)

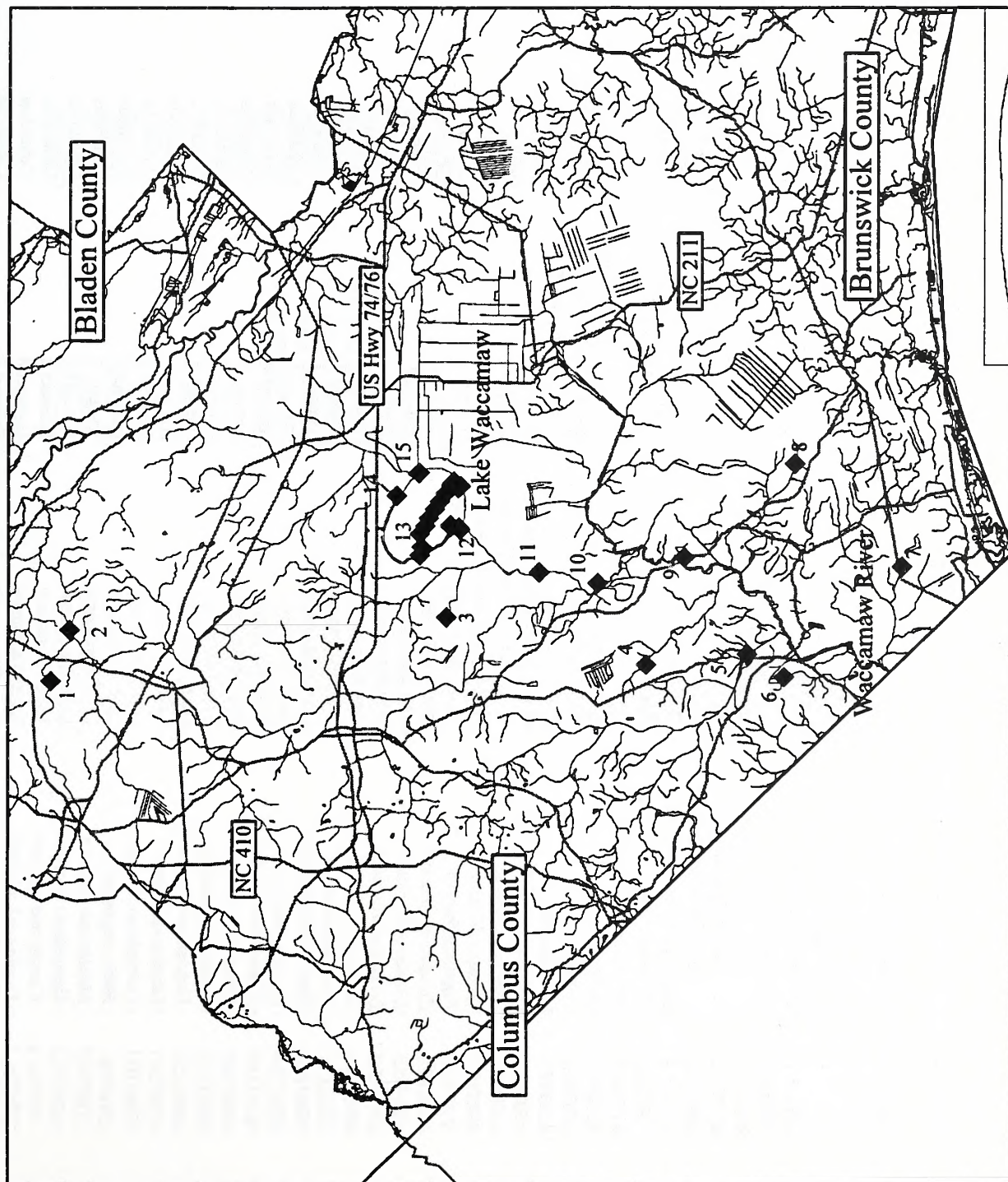
Fragile ancylid

Laevapex fuscus (C.B. Adams, 1841)

Dusky ancylid

LAKE WACCAMAW STATE PARK AQUATIC SNAIL SPECIES INVENTORY

Figure 1.



Station No.

970710.4

970710.3

950706.3

970923.2

970924.1

970924.2

970917.1

970916.1

970729.1

970728.1

970923.1

950706.1

950706.2

970717.4

970717.5

950705.1

950705.2

970715.1-970715.5

970716.1-970716.5

970717.1-970717.3

950707.1

970811.1

970717.6

Dot No.

1

2

3

4

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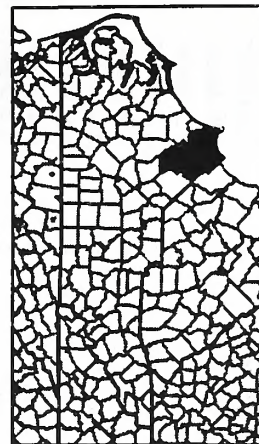
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12

13

14

15



Miles



Table 2. Snails found in Lake Waccamaw State Park and associated waterways

<u>Station No.</u>	<u>Scientific Name</u>	<u>Waterway</u>	<u>Common Locality</u>	<u>County</u>	<u>Date</u>	<u>No.</u>	<u>Identified By</u>
950705.1	<i>Campeloma decisum</i>	Lake Waccamaw	Lake Waccamaw, SP side	Columbus	5 July 1995	12	G.B. Mottesi
950705.1	<i>Lioplax subcarinata</i>	Lake Waccamaw	Lake Waccamaw, SP side	Columbus	5 July 1995	12	G.B. Mottesi
950705.1	<i>Helisoma anceps</i>	Lake Waccamaw	Lake Waccamaw, SP side	Columbus	5 July 1995	4	G.B. Mottesi
950705.2	<i>Helisoma anceps</i>	Lake Waccamaw	Lake Waccamaw, SP side	Columbus	5 July 1995	2	G.B. Mottesi
950705.2	<i>Campeloma decisum</i>	Lake Waccamaw	Lake Waccamaw, SP side	Columbus	5 July 1995	4	G.B. Mottesi
950705.2	<i>Lioplax subcarinata</i>	Lake Waccamaw	Lake Waccamaw, SP side	Columbus	5 July 1995	1	G.B. Mottesi
950706.1	<i>Helisoma anceps</i>	Lake Waccamaw	Lake Wacc. near dam	Columbus	6 July 1995	13	G.B. Mottesi
950706.2	<i>Helisoma anceps</i>	Lake Waccamaw	Lake Wacc. near dam	Columbus	6 July 1995	15	G.B. Mottesi
950706.3	<i>Pseudosuccinea columella</i>	Roadside ditch	SR 1001	Columbus	6 July 1995	1	G.B. Mottesi
950707.1	<i>Gillia altis</i>	Lake Waccamaw	Lake Wacc. @ Com. ramp	Columbus	7 July 1995	45	A. Bogan
950707.1	<i>Campeloma decisum</i>	Lake Waccamaw	Lake Wacc. @ Com. ramp	Columbus	7 July 1995	55	A. Bogan
950707.1	<i>Menetus dilatatus</i>	Lake Waccamaw	Lake Wacc. @ Com. ramp	Columbus	7 July 1995	6	A. Bogan
970710.3	<i>Pseudosuccinea columella</i>	trib. of Brown Marsh Swamp	SR 1700	Bladen	10 July 1997	8	G.B. Mottesi
970710.3	<i>Ferrissia fragilis</i>	trib. of Brown Marsh Swamp	SR 1700	Bladen	10 July 1997	14	G.B. Mottesi
970710.3	<i>Menetus dilatatus</i>	trib. of Brown Marsh Swamp	SR 1700	Bladen	10 July 1997	1	G.B. Mottesi
970710.4	<i>Ferrissia fragilis</i>	trib. of Brown Marsh Swamp	SR 1003	Bladen	10 July 1997	38	G.B. Mottesi
970715.1	<i>Campeloma decisum</i>	Lake Waccamaw	Transect 1	Columbus	15 July 1997	6	G.B. Mottesi
970715.1	<i>Lioplax subcarinata</i>	Lake Waccamaw	Transect 1	Columbus	15 July 1997	30	G.B. Mottesi
970715.2	<i>Lioplax subcarinata</i>	Lake Waccamaw	Transect 2	Columbus	15 July 1997	38	G.B. Mottesi
970715.2	<i>Campeloma decisum</i>	Lake Waccamaw	Transect 2	Columbus	15 July 1997	7	G.B. Mottesi
970715.3	<i>Lioplax subcarinata</i>	Lake Waccamaw	Transect 3	Columbus	15 July 1997	106	G.B. Mottesi
970715.3	<i>Campeloma decisum</i>	Lake Waccamaw	Transect 3	Columbus	15 July 1997	68	G.B. Mottesi
970715.3	<i>Helisoma anceps</i>	Lake Waccamaw	Transect 3	Columbus	15 July 1997	1	G.B. Mottesi
970715.4	<i>Lioplax subcarinata</i>	Lake Waccamaw	Transect 4	Columbus	15 July 1997	79	G.B. Mottesi
970715.4	<i>Campeloma decisum</i>	Lake Waccamaw	Transect 4	Columbus	15 July 1997	15	G.B. Mottesi
970715.5	<i>Campeloma decisum</i>	Lake Waccamaw	Transect 5	Columbus	15 July 1997	14	G.B. Mottesi
970715.5	<i>Lioplax subcarinata</i>	Lake Waccamaw	Transect 5	Columbus	15 July 1997	50	G.B. Mottesi
970716.1	<i>Lioplax subcarinata</i>	Lake Waccamaw	Transect 6	Columbus	16 July 1997	48	G.B. Mottesi
970716.1	<i>Campeloma decisum</i>	Lake Waccamaw	Transect 6	Columbus	16 July 1997	19	G.B. Mottesi
970716.1	<i>Helisoma anceps</i>	Lake Waccamaw	Transect 6	Columbus	16 July 1997	1	G.B. Mottesi
970716.2	<i>Lioplax subcarinata</i>	Lake Waccamaw	Transect 7	Columbus	16 July 1997	3	G.B. Mottesi
970716.2	<i>Campeloma decisum</i>	Lake Waccamaw	Transect 7	Columbus	16 July 1997	15	G.B. Mottesi
970716.3	<i>Campeloma decisum</i>	Lake Waccamaw	Transect 8	Columbus	16 July 1997	14	G.B. Mottesi
970716.3	<i>Lioplax subcarinata</i>	Lake Waccamaw	Transect 8	Columbus	16 July 1997	29	G.B. Mottesi
970716.4	<i>Lioplax subcarinata</i>	Lake Waccamaw	Transect 9	Columbus	16 July 1997	10	G.B. Mottesi
970716.4	<i>Gillia altis</i>	Lake Waccamaw	Transect 9	Columbus	16 July 1997	3	G.B. Mottesi
970716.4	<i>Campeloma decisum</i>	Lake Waccamaw	Transect 9	Columbus	16 July 1997	28	G.B. Mottesi

Table 2. Snails found in Lake Waccamaw State Park and associated waterways (cont.)

<u>Station No.</u>	<u>Scientific Name</u>	<u>Waterway</u>	<u>Common Locality</u>	<u>County</u>	<u>Date</u>	<u>No.</u>	<u>Identified By</u>
970716.5	<i>Gillia altilis</i>	Lake Waccamaw	Transect 10	Columbus	16 July 1997	1	G.B. Mottesi
970716.5	<i>Campeloma decisum</i>	Lake Waccamaw	Transect 10	Columbus	16 July 1997	22	G.B. Mottesi
970716.5	<i>Lioplax subcarinata</i>	Lake Waccamaw	Transect 10	Columbus	16 July 1997	10	G.B. Mottesi
970717.1	<i>Campeloma decisum</i>	Lake Waccamaw	Transect 11	Columbus	17 July 1997	50	G.B. Mottesi
970717.1	<i>Lioplax subcarinata</i>	Lake Waccamaw	Transect 11	Columbus	17 July 1997	12	G.B. Mottesi
970717.2	<i>Campeloma decisum</i>	Lake Waccamaw	Transect 12	Columbus	17 July 1997	39	G.B. Mottesi
970717.2	<i>Lioplax subcarinata</i>	Lake Waccamaw	Transect 12	Columbus	17 July 1997	11	G.B. Mottesi
970717.3	<i>Campeloma decisum</i>	Lake Waccamaw	Transect 13	Columbus	17 July 1997	2	G.B. Mottesi
970717.3	<i>Lioplax subcarinata</i>	Lake Waccamaw	Transect 13	Columbus	17 July 1997	13	G.B. Mottesi
970717.4	<i>Gillia altilis</i>	Lake Waccamaw	Southwest side of lake	Columbus	17 July 1997	13	G.B. Mottesi
970717.5	<i>Laevapex fuscus</i>	Lake Waccamaw	Waccamaw River dam	Columbus	17 July 1997	12	G.B. Mottesi
970717.5	<i>Gillia altilis</i>	Lake Waccamaw	Waccamaw River dam	Columbus	17 July 1997	2	G.B. Mottesi
970717.5	<i>Campeloma decisum</i>	Lake Waccamaw	Waccamaw River dam	Columbus	17 July 1997	2	G.B. Mottesi
970717.6	<i>Campeloma decisum</i>	Big Creek	Waccamaw River dam	Columbus	17 July 1997	Observed	G.B. Mottesi
970728.1	<i>Hydrobiidae</i>	Waccamaw River	near Lake Waccamaw	Columbus	17 July 1997	6	A. Bogan, G.B. Mottesi
970729.1	<i>Menetus dilatatus</i>	Waccamaw River	SR 1928	Columbus	28 July 1997	1	G.B. Mottesi
970729.1	<i>Gillia altilis</i>	Waccamaw River	NC 130	Colum./Brunswick line	29 July 1997	4	G.B. Mottesi
970729.1	<i>Physella sp.</i>	Roadside ditch	NC 130	Colum./Brunswick line	29 July 1997	3	G.B. Mottesi
970811.1	<i>Menetus dilatatus</i>	Roadside ditch	SR 1947	Columbus	11 Aug. 1997	1	G.B. Mottesi
970916.1	<i>Laevapex fuscus</i>	South Prong Creek	SR 1335	Columbus	11 Aug. 1997	18	G.B. Mottesi
970917.1	<i>Ferrissia fragilis</i>	trib. of Cawcaw Swamp	SR 1165	Brunswick	16 Sept. 1997	11	G.B. Mottesi
970917.1	<i>Menetus dilatatus</i>	trib. of Cawcaw Swamp	SR 1165	Brunswick	17 Sept. 1997	4	G.B. Mottesi
970917.1	<i>Physella sp.</i>	trib. of Cawcaw Swamp	SR 1165	Brunswick	17 Sept. 1997	2	G.B. Mottesi
970917.1	<i>Pseudosuccinea columella</i>	trib. of Cawcaw Swamp	SR 1165	Brunswick	17 Sept. 1997	1	G.B. Mottesi
970923.1	<i>Gillia altilis</i>	Waccamaw River	dirt drive off of SR 1930	Columbus	23 Sept. 1997	1	A. Bogan, G.B. Mottesi
970923.1	<i>Helisoma anceps</i>	Waccamaw River	dirt drive off of SR 1930	Columbus	23 Sept. 1997	1	G.B. Mottesi
970923.1	<i>Campeloma decisum</i>	Waccamaw River	dirt drive off of SR 1930	Columbus	23 Sept. 1997	8	G.B. Mottesi
970923.1	<i>Laevapex fuscus</i>	Waccamaw River	dirt drive off of SR 1930	Columbus	23 Sept. 1997	15	G.B. Mottesi
970923.2	<i>Pseudosuccinea columella</i>	trib. of Simmons Bay Creek	SR 1932	Columbus	23 Sept. 1997	1	G.B. Mottesi
970923.2	<i>Physella sp.</i>	trib. of Simmons Bay Creek	SR 1932	Columbus	23 Sept. 1997	3	G.B. Mottesi
970924.1	<i>Physella sp.</i>	Seven Creeks	NC 905	Columbus	24 Sept. 1997	1	G.B. Mottesi
970924.1	<i>Gillia altilis</i>	Seven Creeks	NC 905	Columbus	24 Sept. 1997	7	G.B. Mottesi
970924.1	<i>Campeloma decisum</i>	Seven Creeks	NC 905	Columbus	24 Sept. 1997	26	G.B. Mottesi
970924.1	<i>Laevapex fuscus</i>	Seven Creeks	NC 905	Columbus	24 Sept. 1997	2	G.B. Mottesi
970924.2	<i>Pseudosuccinea columella</i>	trib. of Waccamaw River	SR 1101	Columbus	24 Sept. 1997	3	G.B. Mottesi

Freshwater Mussels and Sphaeriid Clams

Introduction

Freshwater mussels are in the Class Bivalvia. As the name implies, the mussel is separated into right and left shell-secreting centers. The shell itself is a single entity which is divided into right and left portions. Mussels are characterized by having greatly enlarged gills with ciliated filaments for filter feeding. They are an integral part of many aquatic ecosystems. They provide nutrients for insects and other invertebrates and are a food source for other organisms. Due to the fact that they are filter feeders, they are excellent indicators of water quality.

There are approximately 300 species and subspecies of freshwater mussels in the United States. The greatest diversity of these mussels occurs in the Southeast. Roughly 70 species can be found in North Carolina. Unfortunately, approximately half are state listed as Endangered, Threatened, or species of Special Concern (Adams 1990). It appears that the mussel fauna of the United States is in danger of extinction (Williams, et al. 1992). Therefore, it is necessary that we determine the status and distribution of these organisms so that proper management techniques can be applied.

Sphaeriid clams, like freshwater mussels, are in the Class Bivalvia and are filter feeders. The members of this family are considered the pea, pill, nut, or fingernail clams. Due to their well-developed mechanism of passive dispersal and adaptability, sphaeriid clams can be found in almost any body of freshwater. Therefore, their distributions are considered truly cosmopolitan (Branson 1988). In spite of their cosmopolitan distribution, not much is known about sphaeriid clams. They are represented in North America by 38 species of the family Sphaeriidae. In North Carolina, there are approximately 13 species of sphaeriid clams (Adams 1990).

One exotic species, the Asian clam (*Corbicula fluminea* (Müller 1774)), of the family Corbiculidae (Burch 1975) was introduced into this country in 1937 and was found in most of the area surveyed.

Methods

Study areas for this project included the aquatic habitats associated with Lake Waccamaw State Park (Fig. 1, Introduction Section). The substrate of the lake ranged from sand to muck bottom and back to sand as one moves east across the lake. There was minimal woody debris and leaf litter. The hardwood/pine/cypress buffer around the lake was fair to good. The pH of the lake ranged from 5.3 - 7.7. The predominant habitat within the Waccamaw River Basin was pool with some areas providing riffle and run habitat and having sand/silt/woody debris and leaf litter as the substrate. Certain tributaries of the river were swampy with abundant aquatic vegetation. A majority of the basin contained

fair to good hardwood/pine/cypress buffer and a minimal amount of aquatic vegetation. The pH for the basin ranged from 4.1 - 7.1.

Freshwater mussels were collected in Lake Waccamaw and in the Waccamaw River Basin (Fig. 1). Various techniques were utilized including SCUBA, snorkeling, sifting of the substrate, visual and tactile searches, and visual searches of the shores for shells. Live mussels were identified, measured, and returned unharmed to the appropriate habitat. Fresh shells were identified, measured, and kept for curation.

Sphaeriid clams were also collected in Lake Waccamaw and in the Waccamaw River Basin (Fig. 1). Various techniques were utilized including SCUBA, snorkeling, seining, dip netting, sifting of the substrate, and visual and tactile searches. Specimens were preserved and stored in 70% ethanol. Sphaeriid clams were identified using Branson (1988), Burch (1975), and Clarke (1981). With the acquisition of additional information, identifications made of both freshwater mussels and sphaeriid clams may be subject to change.

Results and Discussion

Figure 1 details the localities of the twenty-nine stations where freshwater mussels were found. At least ten species of mussels, all in the family Unionidae, were found in the waterways associated with Lake Waccamaw State Park (Table 1).

Figure 2 details the localities of the three stations where sphaeriid clams were found. At least three species, all within the family Sphaeriidae, were found in the waterways associated with Lake Waccamaw State Park (Table 1).

The specimens falling into either the *Elliptio complanata* or *Elliptio icterina* complexes were listed under the *Elliptio* spp. category. Therefore, these complexes possibly contain several species. The ecophenotypes of these *Elliptio* complexes are found at numerous sites throughout eastern North Carolina (Alderman, pers. comm., 1998). Additional genetic information is necessary to determine the number of species within these complexes. There is also some taxonomic uncertainty with *Lampsilis fullerkatti* R. I. Johnson, 1984, as was shown by Stiven and Alderman (1992).

In 1985, Dr. Hugh Porter completed a survey of the molluscan fauna of Lake Waccamaw. Samples for this survey were taken at quarter-year intervals throughout 1979-1980 from sites randomly chosen in each of the lake's benthic regions (shallow sand, intermediate sand, deep sand, and muck). Some nonquantitative sampling was completed on Big Creek and the Waccamaw River.

In an effort to try to duplicate, on a minimal scale, some of Dr. Porter's work, we inventoried transects running east across the lake. We felt that this would provide a good representative sample of the various habitats that Dr. Porter had chosen to survey. The

transects were approximately 100 yards apart, closer to the shore, and approximately 300 yards apart closer to the center of the lake. Each transect contained 11 quadrats and an area of 0.25 m² was sifted within each quadrat. Mesh baskets, with a mesh size of 3 mm, were used to sift the substrate.

A good diversity and abundance of both mussels and sphaeriid clams occur in the waterways associated with Lake Waccamaw State Park (Table 2). Three Federally listed species of Special Concern and State Threatened species, *Elliptio waccamawensis* (I. Lea, 1863), *Lampsilis cariosa* (Say, 1817) and *Lampsilis fullerkatti* R. I. Johnson, 1984 were found. Two State listed species of Special Concern, *Lampsilis radiata* and *Leptodea ochracea* (Say, 1817) were detected. One Significantly Rare species, *Villosa delumbis* (Conrad, 1834) was found.

Resources

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Table 1. Mussels and Sphaeriid clams found in the waterways associated with Lake Waccamaw State Park

Unionidae

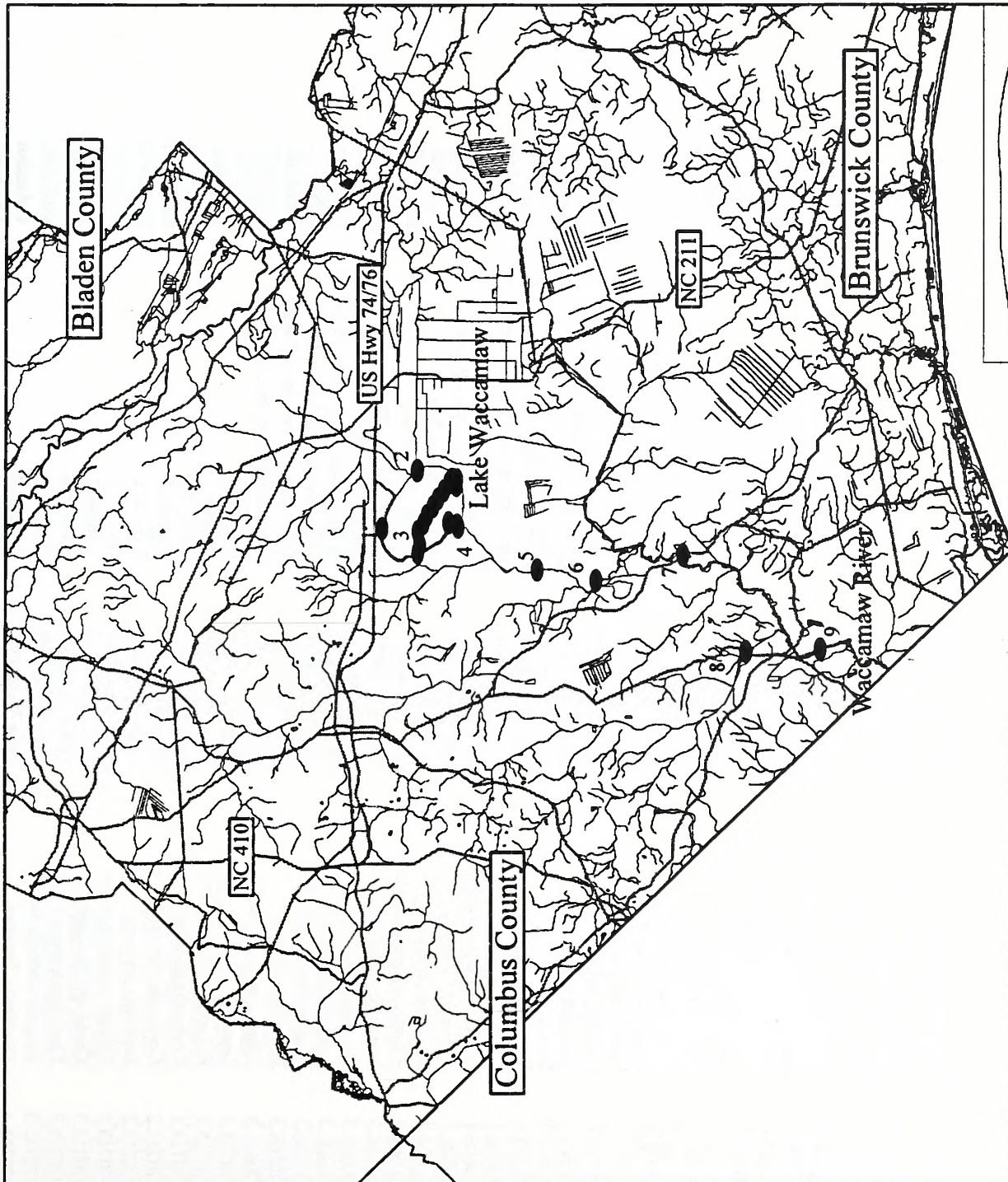
Elliptio spp.

<i>Elliptio waccamawensis</i> (I. Lea, 1863)	Waccamaw spike
<i>Lampsilis cariosa</i> (Say, 1817)	Yellow lampmussel
<i>Lampsilis fullerkati</i> R. I. Johnson, 1984	Waccamaw fatmucket
<i>Lampsilis radiata</i> (Gmelin, 1791)	Eastern lampmussel
<i>lanceolate elliptio</i>	
<i>Leptodea ochracea</i> (Say, 1817)	Tidewater mucket
<i>Pyganodon cataracta</i> (Say, 1817)	Eastern floater
<i>Uniomereus</i> sp.	
<i>Villosa delumbis</i> (Conrad, 1834)	Eastern creekshell

Sphaeriidae

<i>Musculium securis</i> (Prime, 1852)	Pond fingernailclam
<i>Pisidium</i> sp.	
<i>Sphaerium striatinum</i> (Lamarck, 1818)	Striated fingernailclam

LAKE WACCAMAW STATE PARK MUSSEL SPECIES INVENTORY



Dot No.	Station No.
1	970606.1
2	950707.1
3	970717.6
	950705.1
	970606.3
	970715.1-970715.5
	970716.1-970716.5
	970717.1-970717.3
4	950706.1
	950706.2
	970606.2
	970717.5
5	970923.1
6	970728.1
	971008.3
7	970729.1
	971008.2
8	970924.1
9	971008.1

Miles
0 5 10

Figure 1.

Table 2. Mussels found in Lake Waccamaw State Park and associated waterways

<u>Station No.</u>	<u>Scientific Name</u>	<u>Waterway</u>	<u>Common Locality</u>	<u>County</u>	<u>Date</u>	<u>No. (live)</u>	<u>No. (shell)</u>
950705.1	<i>Elliptio waccamawensis</i>	Lake Waccamaw	Lake Waccamaw, SP side	Columbus	5 July 1995	249	
950705.1	<i>Leptodea ochracea</i>	Lake Waccamaw	Lake Waccamaw, SP side	Columbus	5 July 1995	58	
950706.1	<i>Elliptio waccamawensis</i>	Lake Waccamaw	Lake Waccamaw near dam	Columbus	6 July 1995	7	observed
950706.1	<i>Leptodea ochracea</i>	Lake Waccamaw	Lake Waccamaw near dam	Columbus	6 July 1995		
950706.2	<i>Elliptio waccamawensis</i>	Lake Waccamaw	Lake Waccamaw near dam	Columbus	6 July 1995	116	
950706.2	<i>Lampsilis cariosa</i>	Lake Waccamaw	Lake Waccamaw near dam	Columbus	6 July 1995	2	
950706.2	<i>Lampsilis fuller-kati</i>	Lake Waccamaw	Lake Waccamaw near dam	Columbus	6 July 1995	24	
950706.2	<i>Leptodea ochracea</i>	Lake Waccamaw	Lake Waccamaw near dam	Columbus	6 July 1995	17	
950707.1	<i>Elliptio waccamawensis</i>	Lake Waccamaw	Lake Wacc. @ Com. ramp	Columbus	7 July 1995	12	
950707.1	<i>Lampsilis radiata</i>	Lake Waccamaw	Lake Wacc. @ Com. ramp	Columbus	7 July 1995	2	
950707.1	<i>Pyganodon cataracta</i>	Lake Waccamaw	Lake Wacc. @ Com. ramp	Columbus	7 July 1995	common	
950707.1	<i>Unio merus sp.</i>	Lake Waccamaw	Lake Wacc. @ Com. ramp	Columbus	7 July 1995	common	
950707.1	<i>lanceolate elliptio</i>	Lake Waccamaw	Lake Wacc. @ Com. ramp	Columbus	7 July 1995	common	
970606.1	<i>Leptodea ochracea</i>	Lake Waccamaw	Public beach near Dale's Rest.	Columbus	6 June 1997	294	
970606.1	<i>Elliptio waccamawensis</i>	Lake Waccamaw	Public beach near Dale's Rest.	Columbus	6 June 1997	152	
970606.1	<i>Lampsilis fuller-kati</i>	Lake Waccamaw	Public beach near Dale's Rest.	Columbus	6 June 1997	1	
970606.2	<i>Leptodea ochracea</i>	Lake Waccamaw	SR 1967, below dam	Columbus	6 June 1997	4	
970606.2	<i>Elliptio waccamawensis</i>	Lake Waccamaw	SR 1967, below dam	Columbus	6 June 1997	10	
970606.2	<i>Lampsilis fuller-kati</i>	Lake Waccamaw	SR 1967, below dam	Columbus	6 June 1997	1	
970606.3	<i>Leptodea ochracea</i>	Lake Waccamaw	At boardwalk over lake in LWSP	Columbus	6 June 1997	139	
970606.3	<i>Lampsilis fuller-kati</i>	Lake Waccamaw	At boardwalk over lake in LWSP	Columbus	6 June 1997	5	
970606.3	<i>Pyganodon cataracta</i>	Lake Waccamaw	At boardwalk over lake in LWSP	Columbus	6 June 1997	5	
970606.3	<i>lanceolate elliptio</i>	Lake Waccamaw	At boardwalk over lake in LWSP	Columbus	6 June 1997	1	
970606.3	<i>Elliptio waccamawensis</i>	Lake Waccamaw	At boardwalk over lake in LWSP	Columbus	6 June 1997	106	
970715.1	<i>Leptodea ochracea</i>	Lake Waccamaw	Transect 1	Columbus	15 July 1997	7	
970715.1	<i>Elliptio waccamawensis</i>	Lake Waccamaw	Transect 1	Columbus	15 July 1997	36	
970715.1	<i>Corbicula fluminea</i>	Lake Waccamaw	Transect 1	Columbus	15 July 1997	437	
970715.2	<i>Corbicula fluminea</i>	Lake Waccamaw	Transect 2	Columbus	15 July 1997	747	
970715.2	<i>Leptodea ochracea</i>	Lake Waccamaw	Transect 2	Columbus	15 July 1997	11	
970715.2	<i>Elliptio waccamawensis</i>	Lake Waccamaw	Transect 2	Columbus	15 July 1997	35	
970715.3	<i>Corbicula fluminea</i>	Lake Waccamaw	Transect 3	Columbus	15 July 1997	412	
970715.3	<i>Leptodea ochracea</i>	Lake Waccamaw	Transect 3	Columbus	15 July 1997	5	
970715.3	<i>Elliptio waccamawensis</i>	Lake Waccamaw	Transect 3	Columbus	15 July 1997	48	
970715.4	<i>Corbicula fluminea</i>	Lake Waccamaw	Transect 4	Columbus	15 July 1997	58	
970715.4	<i>Leptodea ochracea</i>	Lake Waccamaw	Transect 4	Columbus	15 July 1997	4	
970715.4	<i>Elliptio waccamawensis</i>	Lake Waccamaw	Transect 4	Columbus	15 July 1997	79	
970715.4	<i>Lampsilis cariosa</i>	Lake Waccamaw	Transect 4	Columbus	15 July 1997	2	

Table 2. Mussels found in Lake Waccamaw State Park and associated waterways (cont.)

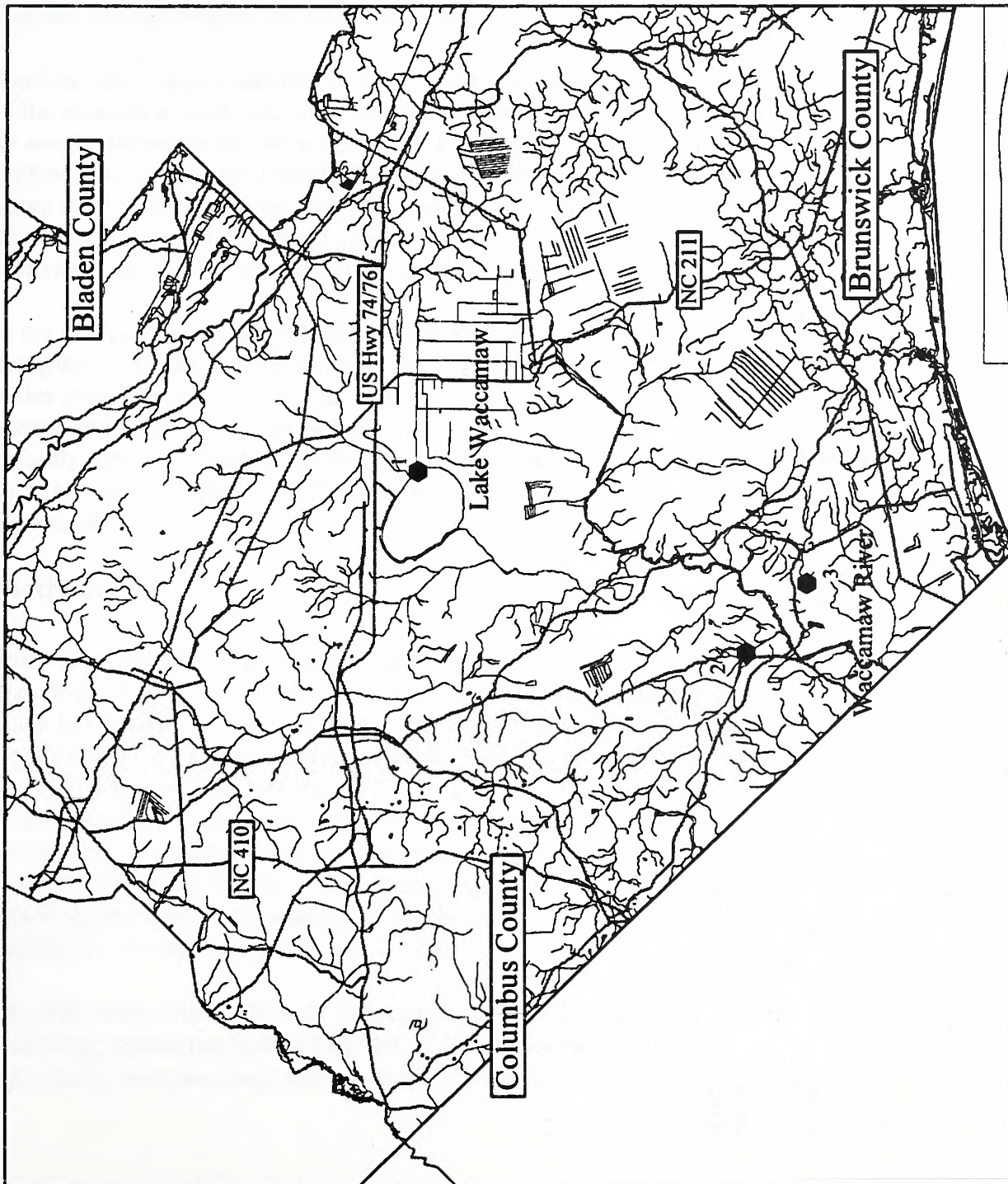
<u>Station No.</u>	<u>Scientific Name</u>	<u>Waterway</u>	<u>Common Locality</u>	<u>County</u>	<u>Date</u>	<u>No. (live)</u>	<u>No. (shell)</u>
970715.4	<i>Lampsilis fullerkati</i>	Lake Waccamaw	Transect 4	Columbus	15 July 1997	3	
970715.5	<i>Elliptio waccamawensis</i>	Lake Waccamaw	Transect 5	Columbus	15 July 1997	82	
970715.5	<i>Lampsilis fullerkati</i>	Lake Waccamaw	Transect 5	Columbus	15 July 1997	3	
970715.5	<i>Leptodea ochracea</i>	Lake Waccamaw	Transect 5	Columbus	15 July 1997	3	
970715.5	<i>Corbicula fluminea</i>	Lake Waccamaw	Transect 5	Columbus	15 July 1997	36	
970716.1	<i>Pyganodon cataracta</i>	Lake Waccamaw	Transect 6	Columbus	16 July 1997		1
970716.1	<i>Corbicula fluminea</i>	Lake Waccamaw	Transect 6	Columbus	16 July 1997	33	
970716.1	<i>Elliptio waccamawensis</i>	Lake Waccamaw	Transect 6	Columbus	16 July 1997	84	
970716.1	<i>Lampsilis fullerkati</i>	Lake Waccamaw	Transect 6	Columbus	16 July 1997	7	
970716.1	<i>Leptodea ochracea</i>	Lake Waccamaw	Transect 6	Columbus	16 July 1997	4	
970716.1	<i>lanceolate elliptio</i>	Lake Waccamaw	Transect 6	Columbus	16 July 1997		1
970716.2	<i>Corbicula fluminea</i>	Lake Waccamaw	Transect 7	Columbus	16 July 1997	1	
970716.2	<i>Lampsilis cariosa</i>	Lake Waccamaw	Transect 7	Columbus	16 July 1997	1	
970716.2	<i>Pyganodon cataracta</i>	Lake Waccamaw	Transect 7	Columbus	16 July 1997	2	
970716.2	<i>Leptodea ochracea</i>	Lake Waccamaw	Transect 7	Columbus	16 July 1997	3	
970716.2	<i>Elliptio waccamawensis</i>	Lake Waccamaw	Transect 7	Columbus	16 July 1997	22	
970716.3	<i>Corbicula fluminea</i>	Lake Waccamaw	Transect 8	Columbus	16 July 1997	5	
970716.3	<i>Elliptio waccamawensis</i>	Lake Waccamaw	Transect 8	Columbus	16 July 1997	36	
970716.3	<i>Leptodea ochracea</i>	Lake Waccamaw	Transect 8	Columbus	16 July 1997	2	
970716.3	<i>Lampsilis cariosa</i>	Lake Waccamaw	Transect 8	Columbus	16 July 1997	1	
970716.4	<i>Corbicula fluminea</i>	Lake Waccamaw	Transect 9	Columbus	16 July 1997	2	
970716.4	<i>Elliptio waccamawensis</i>	Lake Waccamaw	Transect 9	Columbus	16 July 1997	35	
970716.4	<i>Leptodea ochracea</i>	Lake Waccamaw	Transect 9	Columbus	16 July 1997	2	
970716.4	<i>Lampsilis cariosa</i>	Lake Waccamaw	Transect 9	Columbus	16 July 1997	2	
970716.5	<i>Corbicula fluminea</i>	Lake Waccamaw	Transect 10	Columbus	16 July 1997	9	
970716.5	<i>Elliptio waccamawensis</i>	Lake Waccamaw	Transect 10	Columbus	16 July 1997	50	
970716.5	<i>Leptodea ochracea</i>	Lake Waccamaw	Transect 10	Columbus	16 July 1997	1	
970716.5	<i>Lampsilis cariosa</i>	Lake Waccamaw	Transect 10	Columbus	16 July 1997	1	
970717.1	<i>Corbicula fluminea</i>	Lake Waccamaw	Transect 11	Columbus	17 July 1997	6	
970717.1	<i>Elliptio waccamawensis</i>	Lake Waccamaw	Transect 11	Columbus	17 July 1997	47	
970717.1	<i>Leptodea ochracea</i>	Lake Waccamaw	Transect 11	Columbus	17 July 1997	6	
970717.1	<i>Pyganodon cataracta</i>	Lake Waccamaw	Transect 11	Columbus	17 July 1997	1	
970717.2	<i>Corbicula fluminea</i>	Lake Waccamaw	Transect 12	Columbus	17 July 1997	1	
970717.2	<i>Elliptio waccamawensis</i>	Lake Waccamaw	Transect 12	Columbus	17 July 1997	42	
970717.2	<i>Leptodea ochracea</i>	Lake Waccamaw	Transect 12	Columbus	17 July 1997	1	
970717.2	<i>Lampsilis fullerkati</i>	Lake Waccamaw	Transect 12	Columbus	17 July 1997	1	
970717.2	<i>Lampsilis cariosa</i>	Lake Waccamaw	Transect 12	Columbus	17 July 1997	1	

Table 2. Mussels found in Lake Waccamaw State Park and associated waterways (cont.)

<u>Station No.</u>	<u>Scientific Name</u>	<u>Waterway</u>	<u>Common Locality</u>	<u>County</u>	<u>Date</u>	<u>No. (live)</u>	<u>No. (shell)</u>
970717.2	<i>Pyganodon cataracta</i>	Lake Waccamaw	Transect 12	Columbus	17 July 1997	1	
970717.3	<i>Corbicula fluminea</i>	Lake Waccamaw	Transect 13	Columbus	17 July 1997	737	
970717.3	<i>Elliptio waccamawensis</i>	Lake Waccamaw	Transect 13	Columbus	17 July 1997	16	
970717.3	<i>Lampsilis fuller-kati</i>	Lake Waccamaw	Transect 13	Columbus	17 July 1997	5	
970717.3	<i>Leptodea ochracea</i>	Lake Waccamaw	Transect 13	Columbus	17 July 1997	2	
970717.3	<i>Lampsilis cariosa</i>	Lake Waccamaw	Transect 13	Columbus	17 July 1997	3	
970717.5	<i>Lampsilis fuller-kati</i>	Lake Waccamaw	Waccamaw River dam	Columbus	17 July 1997	5	
970717.5	<i>Leptodea ochracea</i>	Lake Waccamaw	Waccamaw River dam	Columbus	17 July 1997	7	
970717.5	<i>Elliptio waccamawensis</i>	Lake Waccamaw	Waccamaw River dam	Columbus	17 July 1997	11	
970717.5	<i>Pyganodon cataracta</i>	Lake Waccamaw	Waccamaw River dam	Columbus	17 July 1997	3	
970717.5	<i>Lampsilis cariosa</i>	Lake Waccamaw	Waccamaw River dam	Columbus	17 July 1997	1	
970717.5	<i>lanceolate elliptio</i>	Lake Waccamaw	Waccamaw River dam	Columbus	17 July 1997	23	
970717.5	<i>Unio merus sp.</i>	Lake Waccamaw	Waccamaw River dam	Columbus	17 July 1997	5	
970717.6	<i>Villosa delumbis</i>	Big Creek	Waccamaw River dam	Columbus	17 July 1997	1	
970717.6	<i>Elliptio spp.</i>	Big Creek	near Lake Waccamaw	Columbus	17 July 1997	5	
970717.6	<i>lanceolate elliptio</i>	Big Creek	near Lake Waccamaw	Columbus	17 July 1997	65	
970717.6	<i>Pyganodon cataracta</i>	Big Creek	near Lake Waccamaw	Columbus	17 July 1997	2	
970717.6	<i>Elliptio waccamawensis</i>	Big Creek	near Lake Waccamaw	Columbus	17 July 1997	13	
970717.6	<i>Unio merus sp.</i>	Big Creek	near Lake Waccamaw	Columbus	17 July 1997	108	
970728.1	<i>Elliptio spp.</i>	Waccamaw River	SR 1928	Columbus	17 July 1997	148	
970728.1	<i>lanceolate elliptio</i>	Waccamaw River	SR 1928	Columbus	28 July 1997	9	
970729.1	<i>Elliptio spp.</i>	Waccamaw River	SR 1928	Columbus	28 July 1997	131	
970923.1	<i>Elliptio spp.</i>	Waccamaw River	NC 130	Columbus	29 July 1997		n/a
970923.1	<i>lanceolate elliptio</i>	Waccamaw River	dirt drive off of SR 1930	Columbus	23 Sept. 1997		n/a
970924.1	<i>lanceolate elliptio</i>	Waccamaw River	dirt drive off of SR 1930	Columbus	23 Sept. 1997		n/a
970924.1	<i>lanceolate elliptio</i>	Seven Creeks	NC 905	Columbus	24 Sept. 1997		1
970924.1	<i>Elliptio spp.</i>	Seven Creeks	NC 905	Columbus	24 Sept. 1997	5	
970924.1	<i>Unio merus sp.</i>	Seven Creeks	NC 905	Columbus	24 Sept. 1997	1	
971008.1	<i>lanceolate elliptio</i>	Waccamaw River	SR 1940	Brunswick	8 Oct. 1997	5	
971008.1	<i>Unio merus sp.</i>	Waccamaw River	SR 1940	Brunswick	8 Oct. 1997	2	
971008.1	<i>Elliptio spp.</i>	Waccamaw River	SR 1940	Brunswick	8 Oct. 1997	78	
971008.2	<i>Unio merus sp.</i>	Waccamaw River	NC130	Brunswick	8 Oct. 1997	1	
971008.2	<i>lanceolate elliptio</i>	Waccamaw River	NC130	Brunswick	8 Oct. 1997	1	
971008.2	<i>Elliptio spp.</i>	Waccamaw River	NC130	Brunswick	8 Oct. 1997	124	
971008.3	<i>lanceolate elliptio</i>	Waccamaw River	SR 1928	Columbus	8 Oct. 1997	14	
971008.3	<i>Unio merus sp.</i>	Waccamaw River	SR 1928	Columbus	8 Oct. 1997	4	
971008.3	<i>Elliptio spp.</i>	Waccamaw River	SR 1928	Columbus	8 Oct. 1997	230	

LAKE WACCAMAW STATE PARK SPHAERIID CLAM SPECIES INVENTORY

Figure 2.



Dot No.
1
2
3

Station No.
950707.1
970924.1
970917.2

Miles



Table 3. Sphaeriid clams found in Lake Waccamaw State Park and associated waterways

<u>Station No.</u>	<u>Scientific Name</u>	<u>Waterway</u>	<u>Common Locality</u>	<u>County</u>	<u>Date</u>	<u>No.</u>	<u>Identified By</u>
950707.1	<i>Musculium securis</i>	Lake Waccamaw	Lake Wacc. @ Corn. ramp	Columbus	7 July 1995	3	A. Bogan
950707.1	<i>Sphaerium striatinum</i>	Lake Waccamaw	Lake Wacc. @ Corn. ramp	Columbus	7 July 1995	6	A. Bogan
950707.1	<i>Pisidium</i> sp.	Lake Waccamaw	Lake Wacc. @ Corn. ramp	Columbus	7 July 1995	11	A. Bogan
970917.2	<i>Musculium securis</i>	Schippeo Swamp	SR 1300	Brunswick	17 Sept. 1997	3	G.B. Mottesi
970924.1	<i>Musculium securis</i>	Seven Creeks	NC 905	Columbus	24 Sept. 1997	3	G.B. Mottesi

Crayfish

Introduction

There are currently 338 recognized species of crayfish in the United States and Canada, the greatest diversity of which reside in the Southeast (Taylor et al. 1996). In North Carolina, there are 30 native and 2 introduced species of crayfish (Cooper, pers. comm., 1998). Of these 32 species, nine are listed as significantly rare by the North Carolina Natural Heritage Program (LeGrand and Hall 1995).

Crayfish play a significant role in aquatic ecosystems by representing a large percentage of the biomass in lentic and lotic waters. They are gill breathing organisms and require an aquatic habitat to absorb oxygen from the water. In accordance with habitat preferences, crayfish are classified as either non-burrowers or burrowers. Non-burrowers spend their entire life in the stream bed while burrowers excavate tunnels in roadside ditches, wet pastures, and flood plains (Taylor et al. 1996). Different species of burrowers spend different amounts of their life cycle in subterranean domains.

In the family Cambaridae (which includes all North Carolina species), there are two designations for adult male crayfish: Form I and Form II. Throughout their lives, adult males cycle between these forms. Morphologically both forms are similar except in the texture and shape of the first pleopod (the sexual organ). Form I males are able to sexually reproduce while Form II males are not. Unlike adult males, adult females do not cycle between morphological forms and once they reach adulthood, they can sexually reproduce.

Methods

Study areas for this project included the aquatic habitats associated with Lake Waccamaw State Park (Fig. 1, Introduction Section). The substrate of the lake ranged from sand to muck bottom and back to sand as one moves east across the lake. There was minimal woody debris and leaf litter. The hardwood/pine/cypress buffer around the lake was fair to good. The pH of the lake ranged from 5.3 - 7.7. The predominant habitat within the Waccamaw River Basin was pool with some areas providing riffle and run habitat and having sand/silt/woody debris and leaf litter as the substrate. Certain tributaries of the river were swampy with abundant aquatic vegetation. A majority of the basin contained a fair to good hardwood/pine/cypress buffer and a minimal amount of aquatic vegetation. The pH for the basin ranged from 4.1 - 7.1.

Crayfish were collected in Lake Waccamaw and the Waccamaw River Basin (Fig. 1). Collecting techniques included the use of dip nets and a 6' x 10' minnow seine. Specimens were preserved and stored in 70% ethanol.

The following sources were consulted for identification: Cooper (1998), Hobbs (1989), Hobbs (1991), and Page (1985). Dr. John Cooper, NC State Museum of Natural Sciences, and Mara Savacool Zimmerman also provided invaluable assistance. With additional information, the present identifications may be subject to change.

The key feature used to differentiate crayfish species from one another is the morphology and structure of the first pleopod pair of the Form I male. Form II males, juvenile males, and females can be recognized by their carapace, chelae, rostrum shape, and body coloration.

Specimens were recorded as Form I male (MI), Form II male (MII), juvenile male (jM), adult female (F), and juvenile female (jF). Adult versus juvenile specimens were distinguished based on size. Carapace length was measured from the tip of the rostrum to the posterior carapace edge (Page 1985).

Results and Discussion

Figure 1 details the localities of the thirteen stations where crayfish were found. Six species of crayfish were found within the waterways associated with Lake Waccamaw State Park (Table 1).

Procambarus (O.) acutus acutus (Girard, 1852) was found in pool habitat and among aquatic vegetation. A total of 8 specimens were collected (3jM, 5F).

Procambarus (O.) ancylus (Hobbs, 1958) was found in pool habitat over sand substrate. A total of 9 specimens were collected (4jM, 5jF). Carapace length ranged from 10.00 to 13.05 mm.

Procambarus (O.) blandingii (Harlan, 1830) was found in pool habitat among aquatic vegetation. A total of 12 specimens and parts were collected (3MI, 4MII, 2F, 1jM). Carapace length ranged from 8.35 to 39.10 mm. Form I males were collected on 6 July 1995 and 23 September 1997.

Procambarus (O.) braswelli (Cooper, 1998) was found in pool habitat over sand substrate. A total of 3 specimens and parts were collected (1jM, 2F). Carapace length ranged from 13.00 to 26.00 mm.

Procambarus (O.) pearsei (Creaser, 1934) was found among aquatic vegetation. A total of 60 specimens were collected (3MI, 12MII, 7jM, 25F, 13jF). Carapace length ranged from 6.85 to 31.05 mm. Form I males were collected on 6 July 1995.

Procambarus (O.) sp. was found among aquatic vegetation. A total of one specimen was collected (1jF). Carapace length was 14.90 mm.

There is a good diversity and distribution of crayfish within the waterways associated with Lake Waccamaw State Park (Table 2).

Resources

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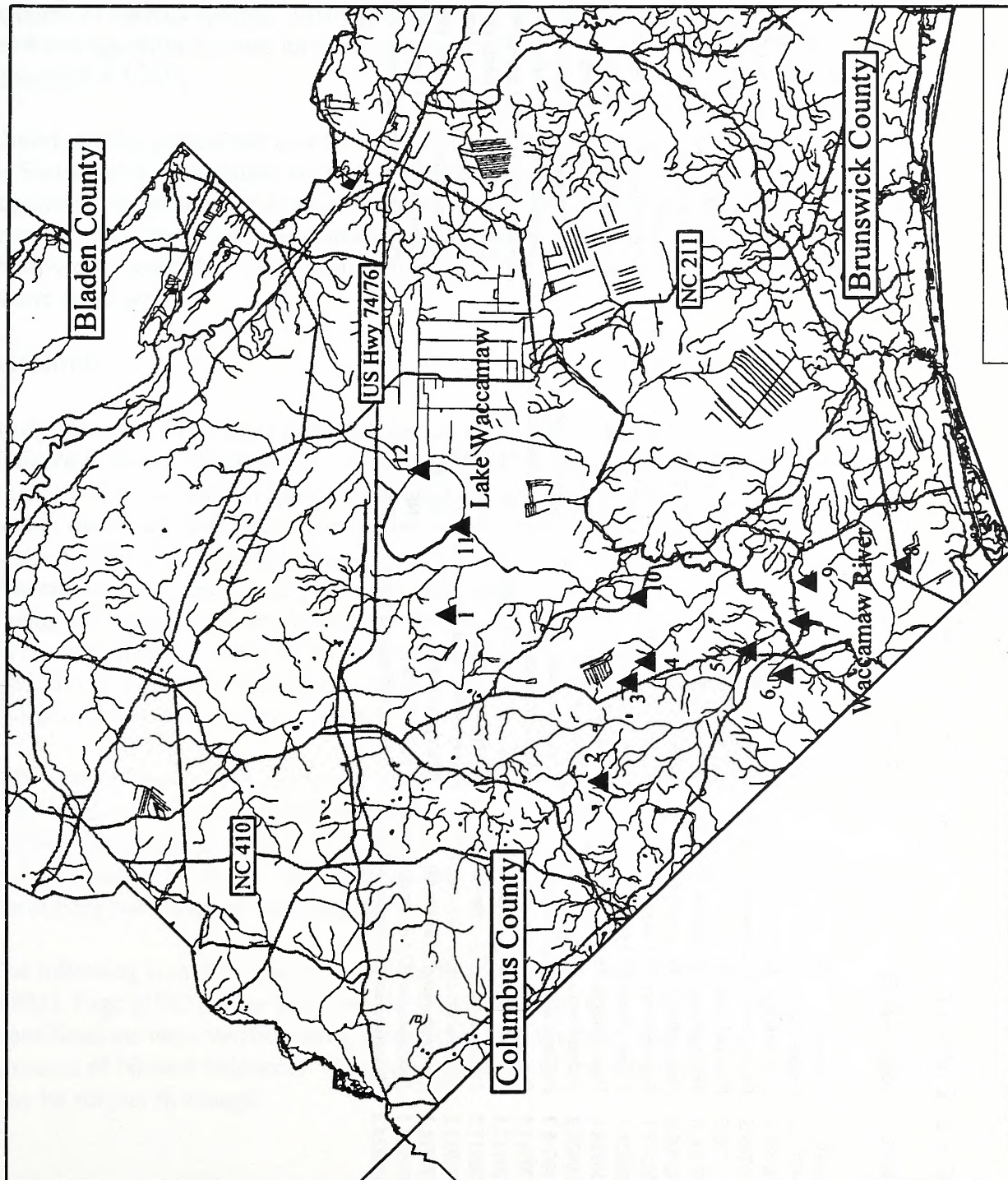
Table 1. Crayfish found in the waterways associated with Lake Waccamaw State Park

Cambaridae

<i>Procambarus (Ortmannicus) acutus acutus</i> (Girard, 1852)	
<i>Procambarus (Ortmannicus) ancylus</i> (Hobbs, 1958)	Edisto crayfish
<i>Procambarus (Ortmannicus) blandingii</i> (Harlan, 1830)	
<i>Procambarus (Ortmannicus) braswelli</i> (Cooper, 1998)	
<i>Procambarus (Ortmannicus) pearsei</i> (Creaser, 1934)	Sandhills crayfish
<i>Procambarus (Ortmannicus) sp.</i>	

LAKE WACCAMAW STATE PARK CRAYFISH SPECIES INVENTORY

Figure 1.



Dot No.

1

2

3

4

5

6

7

8

9

10

11

12

Station No.

950706.3

950706.5

950706.4

970923.2

970924.1

970924.2

950928.2

970917.1

970917.2

950928.1

970606.2

970717.5

950707.1

Miles



Table 2. Crayfish found in Lake Waccamaw State Park and associated waterways

<u>Station No.</u>	<u>Scientific Name</u>	<u>Waterway</u>	<u>Common Locality</u>	<u>County</u>	<u>Date</u>	<u>Number/Sex</u>	<u>Identified By</u>
950706.3	<i>Procambarus (O.) blandingii</i>	Roadside ditch	SR 1001	Columbus Co.	6 July 1995	2MII, 1F, 2jF	J.E. Cooper, M.E. Savacool
950706.4	<i>Procambarus (O.) blandingii</i>	Roadside ditch	SR 1006	Columbus Co.	6 July 1995	IMI, 1F	J.E. Cooper, M.E. Savacool
950706.4	<i>Procambarus (O.) pearsei</i>	Roadside ditch	SR 1006	Columbus Co.	6 July 1995	IMI, IMII, IjM, 5F	M.E. Savacool
950706.5	<i>Procambarus (O.) pearsei</i>	Roadside ditch	SR 1117	Columbus Co.	6 July 1995	IMI, IjM, 2F, 5jF	M.E. Savacool
950706.5	<i>Procambarus (O.) sp.</i>	Roadside ditch	SR 1117	Columbus Co.	6 July 1995	IjF	M.E. Savacool
950706.6	<i>Procambarus (O.) blandingii</i>	Roadside ditch	SR 1157	Columbus Co.	6 July 1995	IMI, IMII	M.E. Savacool
950706.6	<i>Procambarus (O.) pearsei</i>	Roadside ditch	SR 1157	Columbus Co.	6 July 1995	2MI, 3jF	M.E. Savacool
950707.1	<i>Procambarus (O.) ancylus</i>	Lake Waccamaw	Lake Wacc. @ Com. ramp	Columbus Co.	7 July 1995	4jM, 5jF	M.E. Savacool
950928.1	<i>Procambarus (O.) pearsei</i>	Roadside ditch	NC 130	Columbus Co.	28 Sept. 1995	9MII, 3jM, 14F, 4jF	J.E. Cooper, M.E. Savacool
950928.1	<i>Procambarus (O.) blandingii</i>	Roadside ditch	NC 130	Columbus Co.	28 Sept. 1995	IMI, IjM	J.E. Cooper, M.E. Savacool
950928.2	<i>Procambarus (O.) pearsei</i>	Roadside ditch	NC 904	Columbus Co.	28 Sept. 1995	IMI, 2jM, 4F, IjF	M.E. Savacool
970606.2	<i>Procambarus (O.) braswelli</i>	Lake Waccamaw	SR 1967, below dam	Columbus Co.	6 June 1997	parts	J.E. Cooper, G.B. Mottesi
970717.5	<i>Procambarus (O.) braswelli</i>	Lake Waccamaw	Waccamaw River dam	Columbus Co.	17 July 1997	IjM, 1F	J.E. Cooper, G.B. Mottesi
970917.1	<i>Procambarus (O.) acutus acutus</i>	trib. of Cawcaw Swamp	SR 1165	Brunswick Co.	17 Sept. 1997	3jM, 3F	J.E. Cooper, G.B. Mottesi
970917.2	<i>Procambarus (O.) acutus acutus</i>	Scipieo Swamp	SR 1300	Brunswick Co.	17 Sept. 1997	1F	J.E. Cooper, G.B. Mottesi
970923.2	<i>Procambarus (O.) blandingii</i>	trib. of Simmons Bay Creek	SR 1932	Columbus Co.	23 Sept. 1997	IMI, parts	J.E. Cooper, G.B. Mottesi
970924.1	<i>Procambarus (O.) braswelli</i>	Seven Creeks	NC 905	Columbus Co.	24 Sept. 1997	1F	J.E. Cooper, G.B. Mottesi
970924.1	<i>Procambarus (O.) cf. acutus acutus</i>	Seven Creeks	NC 905	Columbus Co.	24 Sept. 1997	3jM, 2F	J.E. Cooper, G.B. Mottesi
970924.2	<i>Procambarus (O.) acutus acutus</i>	trib. of Waccamaw River	SR 1101	Columbus Co.	24 Sept. 1997	1F	J.E. Cooper, G.B. Mottesi

Freshwater Fishes

Introduction

Approximately 790 fish species are believed to occur in the freshwaters of the United States and Canada (Page & Burr 1991). More than 225 species can be found in North Carolina (Menhinick 1991). This unusually rich and variable fish fauna is due to a great diversity of habitats found within the state and to different zoogeographic distribution patterns of various species. Many game species, several bait and forage species, and at least one aquarium species have become established in the waters of North Carolina (Menhinick 1991).

Unfortunately, almost one quarter of the fish occurring in North Carolina are state listed as Endangered, Threatened, or Special Concern species. This is of concern since fish are important components of aquatic ecosystems; they are indicators of water quality; and many species are a source of recreation for the state's citizens. Therefore, it is important that we determine their status/distributions and apply proper conservation techniques where necessary.

Methods

Study areas for this project included the aquatic habitats associated with Lake Waccamaw State Park (Fig. 1, Introduction Section). The substrate of the lake ranged from sand to muck bottom and back to sand as one moves east across the lake. There was minimal woody debris and leaf litter. The hardwood/pine/cypress buffer around the lake was fair to good. The pH of the lake ranged from 5.3 - 7.7. The predominant habitat within the Waccamaw River Basin was pool with some areas providing riffle and run habitat and having sand/silt/woody debris and leaf litter as the substrate. Certain tributaries of the river were swampy with abundant aquatic vegetation. A majority of the basin contained a fair to good hardwood/pine/cypress buffer and a minimal amount of aquatic vegetation. The pH for the basin ranged from 4.1 - 7.1.

Fish were collected Lake Waccamaw and the Waccamaw River Basin (Fig. 1). Collecting techniques included the use of a 6' x 10' minnow seine and dip nets. Different techniques of seining, such as kicking, and setting and dragging, were utilized according to the habitat. Specimens were fixed in 10% formalin and preserved in 70% ethanol. Specimens not collected were returned unharmed.

The following sources were used as identification tools: Jenkins (1995), Menhinick (1991), Page (1983), Page and Burr (1991), and Rohde, et al. (1994). Some identifications were verified using specimens from the collection of the NC State Museum of Natural Sciences. With the acquisition of more information, identifications may be subject to change.

Results and Discussion

Figure 1 details the localities of the thirteen stations where fish were found. Twenty-nine species of fish representing fourteen families were found within the waterways associated with Lake Waccamaw State Park (Table 1).

Many of the species that we found in the waterways associated with Lake Waccamaw State Park were also found by Mary Moser and Fred Rohde (1998), who lead a Waccamaw River gamefish assesment survey, by Keith Ashley (Fisheries Biologist, NCWRC) who lead a survey of the Waccamaw River in 1997, and by Darrel E. Louder (1962) who compiled an annotated checklist of the fishes within the Carolina bays. Moser and Rohde used rotenone sampling, Ashley used a boat shocker, and Louder used rotenone, gill nets, and trammel nets. Following is a list of other species which each of their surveys discovered.

Moser and Rohde:

*"Broadtail" madtom
Brook silverside
Brown bullhead
Chain pickerel
Dollar sunfish
Longnose gar
Marginated madtom
Mud sunfish
Redear sunfish
Snail bullhead
Spotted sunfish
Taillight shiner
Tadpole madtom
White catfish

Louder:

Black crappie
Chain pickerel
Common Carp
Flat bullhead
Gizzard shad
Longnose gar
Mud sunfish
Spotted sunfish
Tadpole madtom
*Waccamaw darter
*Waccamaw killifish
White catfish

Ashley:

Chain pickerel
Channel catfish
Dollar sunfish
Longnose gar
Redear sunfish
Spotted sunfish

Fish species diversity and abundance are good within the waterways associated with Lake Waccamaw State Park (Table 2). One State Listed species of Special Concern, *Semotilus lumbee* Snelson & Suttkus, 1978, the Sandhills chub, and one Federally and State Threatened species, *Menidia extensa* Hubbs & Raney, 1946, the Waccamaw silverside, were detected by our survey. *Semotilus lumbee* was found at one site, a tributary of the Waccamaw River, and *Menidia extensa* was found at two sites, in Lake Waccamaw and the Waccamaw River.

In 1990, Fred Rohde conducted a status survey of *Elassoma boehlkei* Rohde and Arndt, 1987, the Carolina pygmy sunfish, and found it most abundantly in Juniper Creek, Columbus and Brunswick counties. Due to the work already done in this area our survey did not encompass Juniper Creek.

* The "Broadtail" madtom is State listed Special Concern; Waccamaw darter is State listed Threatened; Waccamaw killifish is Federally and State listed Special Concern.

Resources

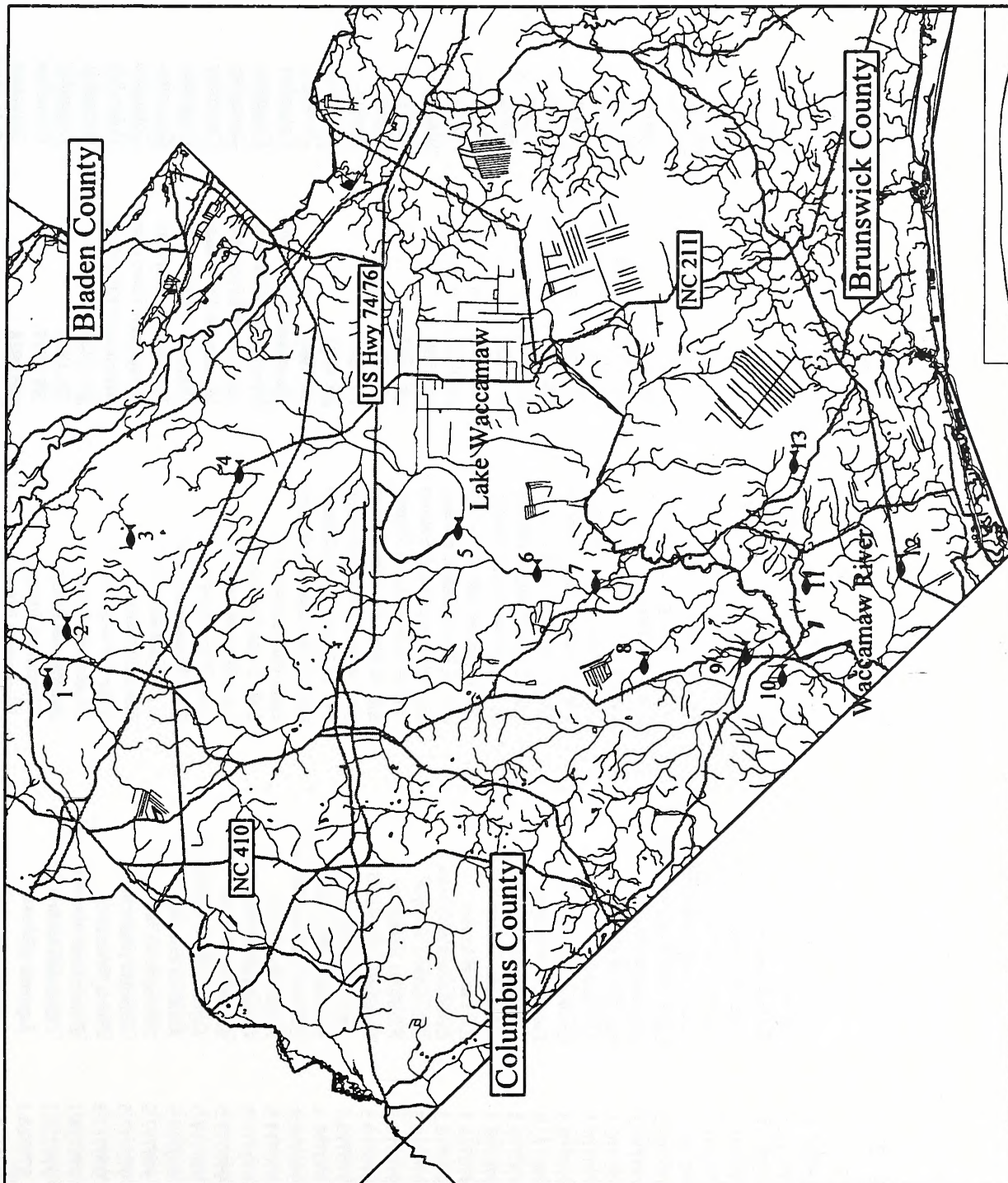
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Table 1. Fish found in the waterways associated with Lake Waccamaw State Park

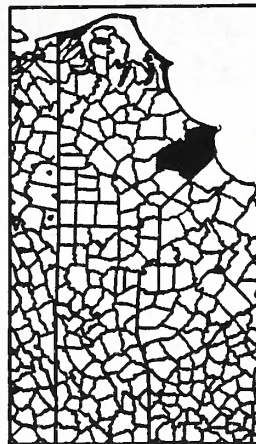
Amiidae	
<i>Amia calva</i> Linnaeus, 1766	Bowfin
Anguillidae	
<i>Anguilla rostrata</i> (Lesuer, 1817)	American eel
Cyprinidae	
<i>Notemigonus crysoleucas</i> (Mitchill, 1814)	Golden shiner
<i>Notropis chalybaeus</i> (Cope, 1869)	Ironcolor shiner
<i>Notropis petersoni</i> Fowler, 1942	Coastal shiner
<i>Semotilus lumbee</i> Snelson & Suttkus, 1978	Sandhills chub
Catostomidae	
<i>Erimyzon oblongus</i> (Mitchill, 1814)	Creek chubsucker
<i>Erimyzon sucetta</i> (Lacépède, 1803)	Lake chubsucker
Ictaluridae	
<i>Ameiurus natalis</i> (Lesueur, 1819)	Yellow bullhead
Esocidae	
<i>Esox americanus</i> Gmelin, 1788	Redfin pickerel
Umbridae	
<i>Umbra pygmaea</i> (Dekay, 1842)	Eastern mudminnow
Aphredoderidae	
<i>Aphredoderus sayanus</i> (Gilliams, 1824)	Pirate perch
Atherinidae	
<i>Menidia extensa</i> Hubbs & Raney, 1946	Waccamaw silverside
Fundulidae	
<i>Fundulus lineolatus</i> (Agassiz, 1854)	Lined topminnow
Poeciliidae	
<i>Gambusia holbrooki</i> Girard, 1859	Eastern mosquitofish
Elassomatidae	
<i>Elassoma zonatum</i> Jordan, 1877	Banded pygmy sunfish
Centrarchidae	
<i>Centrarchus macropterus</i> (Lacépède, 1801)	Flier
<i>Chaenobryttus gulosus</i> (Cuvier, 1829)	Warmouth
<i>Enneacanthus gloriosus</i> (Holbrook, 1855)	Bluespotted sunfish
<i>Enneacanthus obesus</i> (Girard, 1854)	Banded sunfish
<i>Lepomis auritus</i> (Linnaeus, 1758)	Redbreast sunfish
<i>Lepomis gibbosus</i> (Linnaeus, 1758)	Pumpkinseed sunfish
<i>Lepomis macrochirus</i> Rafinesque, 1819	Bluegill sunfish
<i>Micropterus salmoides</i> (Lacépède, 1802)	Largemouth bass
<i>Pomoxis nigromaculatus</i> (Lesueur, 1829)	Black crappie
Percidae	
<i>Etheostoma fusiforme</i> (Girard, 1854)	Swamp darter
<i>Etheostoma olmstedii</i> Storer, 1842	Tessellated darter
<i>Etheostoma serrifer</i> (Hubbs & Cannon, 1935)	Sawcheek darter
<i>Perca flavescens</i> (Mitchill, 1814)	Yellow perch

LAKE WACCAMAW STATE PARK FISH SPECIES INVENTORY

Figure 1.



Dot No.	Station No.
1	970710.4
2	970710.3
3	970710.2
4	970710.1
5	970717.5
6	970923.1
7	970728.1
8	970923.1
9	970924.1
10	970924.2
11	970917.2
12	970917.1
13	970916.1



Miles



Table 2. Fish found in Lake Waccamaw State Park and associated waterways

<u>Station No.</u>	<u>Scientific Name</u>	<u>Waterway</u>	<u>Common Locality</u>	<u>County</u>	<u>Date</u>	<u>No.</u>	<u>Identified By</u>
970710.1	<i>Ameiurus natalis</i>	Friar Swamp	NC 211	Bladen	10 July 1997	8	G.B. Mottesi
970710.1	<i>Aphredoderus sayanus</i>	Friar Swamp	NC 211	Bladen	10 July 1997	3	G.B. Mottesi
970710.1	<i>Centrarchus macropterus</i>	Friar Swamp	NC 211	Bladen	10 July 1997	104	G.B. Mottesi
970710.1	<i>Chaenobryttus gulosus</i>	Friar Swamp	NC 211	Bladen	10 July 1997	1	G.B. Mottesi
970710.1	<i>Lepomis macrochirus</i>	Friar Swamp	NC 211	Bladen	10 July 1997	1	G.B. Mottesi
970710.1	<i>Pomoxis nigromaculatus</i>	Friar Swamp	NC 211	Bladen	10 July 1997	1	G.B. Mottesi
970710.2	<i>Centrarchus macropterus</i>	Middle Swamp	SR 1713	Bladen	10 July 1997	n/a	G.B. Mottesi
970710.2	<i>Esox americanus</i>	Middle Swamp	SR 1713	Bladen	10 July 1997	n/a	G.B. Mottesi
970710.2	<i>Gambusia holbrooki</i>	Middle Swamp	SR 1713	Bladen	10 July 1997	common	G.B. Mottesi
970710.3	<i>Aphredoderus sayanus</i>	trib. of Brown Marsh Swamp	SR 1700	Bladen	10 July 1997	1	G.B. Mottesi
970710.3	<i>Centrarchus macropterus</i>	trib. of Brown Marsh Swamp	SR 1700	Bladen	10 July 1997	1	G.B. Mottesi
970710.3	<i>Elassoma zonatum</i>	trib. of Brown Marsh Swamp	SR 1700	Bladen	10 July 1997	1	G.B. Mottesi
970710.3	<i>Emmeacanthus obesus</i>	trib. of Brown Marsh Swamp	SR 1700	Bladen	10 July 1997	3	G.B. Mottesi
970710.3	<i>Erinizon suetta</i>	trib. of Brown Marsh Swamp	SR 1700	Bladen	10 July 1997	5	G.B. Mottesi
970710.3	<i>Esox americanus</i>	trib. of Brown Marsh Swamp	SR 1700	Bladen	10 July 1997	3	G.B. Mottesi
970710.3	<i>Etheostoma fusiforme</i>	trib. of Brown Marsh Swamp	SR 1700	Bladen	10 July 1997	3	G.B. Mottesi
970710.3	<i>Etheostoma serrafer</i>	trib. of Brown Marsh Swamp	SR 1700	Bladen	10 July 1997	2	G.B. Mottesi
970710.3	<i>Fundulus lineolatus</i>	trib. of Brown Marsh Swamp	SR 1700	Bladen	10 July 1997	1	G.B. Mottesi
970710.3	<i>Gambusia holbrooki</i>	trib. of Brown Marsh Swamp	SR 1700	Bladen	10 July 1997	abundant	G.B. Mottesi
970710.4	<i>Ameiurus natalis</i>	trib. of Brown Marsh Swamp	SR 1003	Bladen	10 July 1997	3	G.B. Mottesi
970710.4	<i>Aphredoderus sayanus</i>	trib. of Brown Marsh Swamp	SR 1003	Bladen	10 July 1997	1	G.B. Mottesi
970710.4	<i>Centrarchus macropterus</i>	trib. of Brown Marsh Swamp	SR 1003	Bladen	10 July 1997	11	G.B. Mottesi
970717.5	<i>Anguilla rostrata</i>	Lake Waccamaw	Waccamaw River dam	Columbus	17 July 1997	4	G.B. Mottesi
970717.5	<i>Gambusia holbrooki</i>	Lake Waccamaw	Waccamaw River dam	Columbus	17 July 1997	common	G.B. Mottesi
970717.5	<i>Lepomis gibbosus</i>	Lake Waccamaw	Waccamaw River dam	Columbus	17 July 1997	17	G.B. Mottesi
970717.5	<i>Lepomis macrochirus</i>	Lake Waccamaw	Waccamaw River dam	Columbus	17 July 1997	21	G.B. Mottesi
970717.5	<i>Menidia extensa</i>	Lake Waccamaw	Waccamaw River dam	Columbus	17 July 1997	schooling	G.B. Mottesi
970717.5	<i>Micropterus salmoides</i>	Lake Waccamaw	Waccamaw River dam	Columbus	17 July 1997	1	G.B. Mottesi
970717.5	<i>Notropis petersoni</i>	Lake Waccamaw	Waccamaw River dam	Columbus	17 July 1997	2	G.B. Mottesi
970717.5	<i>Percia flavescens</i>	Lake Waccamaw	Waccamaw River dam	Columbus	17 July 1997	2	G.B. Mottesi
970728.1	<i>Etheostoma olmstedi</i>	Waccamaw River	SR 1928	Columbus	28 July 1997	1	G.B. Mottesi
970728.1	<i>Gambusia holbrooki</i>	Waccamaw River	SR 1928	Columbus	28 July 1997	abundant	G.B. Mottesi
970728.1	<i>Lepomis gibbosus</i>	Waccamaw River	SR 1928	Columbus	28 July 1997	13	G.B. Mottesi
970728.1	<i>Lepomis macrochirus</i>	Waccamaw River	SR 1928	Columbus	28 July 1997	4	G.B. Mottesi
970728.1	<i>Menidia extensa</i>	Waccamaw River	SR 1928	Columbus	28 July 1997	1	G.B. Mottesi
970728.1	<i>Percia flavescens</i>	Waccamaw River	SR 1928	Columbus	28 July 1997	4	G.B. Mottesi

Table 2. Fish found in Lake Waccamaw State Park and associated waterways (cont.)

<u>Station No.</u>	<u>Scientific Name</u>	<u>Waterway</u>	<u>Common Locality</u>	<u>County</u>	<u>Date</u>	<u>No.</u>	<u>Identified By</u>
970916.1	<i>Centrarchus macropterus</i>	South Prong Creek	SR 1335	Brunswick	16 Sept. 1997	80	G.B. Mottesi
970916.1	<i>Enneacanthus obesus</i>	South Prong Creek	SR 1335	Brunswick	16 Sept. 1997	6	G.B. Mottesi
970916.1	<i>Esox americanus</i>	South Prong Creek	SR 1335	Brunswick	16 Sept. 1997	11	G.B. Mottesi
970916.1	<i>Gambusia holbrooki</i>	South Prong Creek	SR 1335	Brunswick	16 Sept. 1997	abundant	G.B. Mottesi
970917.1	<i>Ameiurus natalis</i>	trib. of Cawcaw Swamp	SR 1165	Brunswick	17 Sept. 1997	1	G.B. Mottesi
970917.1	<i>Aphredoderus sayanus</i>	trib. of Cawcaw Swamp	SR 1165	Brunswick	17 Sept. 1997	6	G.B. Mottesi
970917.1	<i>Centrarchus macropterus</i>	trib. of Cawcaw Swamp	SR 1165	Brunswick	17 Sept. 1997	1	G.B. Mottesi
970917.1	<i>Elassoma zonatum</i>	trib. of Cawcaw Swamp	SR 1165	Brunswick	17 Sept. 1997	3	G.B. Mottesi
970917.1	<i>Enneacanthus gloriosus</i>	trib. of Cawcaw Swamp	SR 1165	Brunswick	17 Sept. 1997	5	G.B. Mottesi
970917.1	<i>Esox americanus</i>	trib. of Cawcaw Swamp	SR 1165	Brunswick	17 Sept. 1997	1	G.B. Mottesi
970917.1	<i>Gambusia holbrooki</i>	trib. of Cawcaw Swamp	SR 1165	Brunswick	17 Sept. 1997	abundant	G.B. Mottesi
970917.1	<i>Lepomis macrochirus</i>	trib. of Cawcaw Swamp	SR 1165	Brunswick	17 Sept. 1997	1	G.B. Mottesi
970917.1	<i>Notemigonus crysoleucas</i>	trib. of Cawcaw Swamp	SR 1165	Brunswick	17 Sept. 1997	1	G.B. Mottesi
970917.1	<i>Notropis chalybaeus</i>	trib. of Cawcaw Swamp	SR 1165	Brunswick	17 Sept. 1997	3	G.B. Mottesi
970917.2	<i>Ameiurus natalis</i>	Scipoeo Swamp	SR 1300	Brunswick	17 Sept. 1997	1	G.B. Mottesi
970917.2	<i>Gambusia holbrooki</i>	Scipoeo Swamp	SR 1300	Brunswick	17 Sept. 1997	2	G.B. Mottesi
970923.1	<i>Ameiurus natalis</i>	trib. of Simmon's Bay Creek	dirt drive off of SR 1930	Columbus	23 Sept. 1997	3	G.B. Mottesi
970923.1	<i>Amia calva</i>	Waccamaw River	dirt drive off of SR 1930	Columbus	23 Sept. 1997	1	G.B. Mottesi
970923.1	<i>Chaenobryttus gulosus</i>	trib. of Simmon's Bay Creek	dirt drive off of SR 1930	Columbus	23 Sept. 1997	1	G.B. Mottesi
970923.1	<i>Erimyzon oblongus</i>	trib. of Simmon's Bay Creek	dirt drive off of SR 1930	Columbus	23 Sept. 1997	3	G.B. Mottesi
970923.1	<i>Esox americanus</i>	trib. of Simmon's Bay Creek	dirt drive off of SR 1930	Columbus	23 Sept. 1997	abundant	G.B. Mottesi
970923.1	<i>Gambusia holbrooki</i>	trib. of Simmon's Bay Creek	dirt drive off of SR 1930	Columbus	23 Sept. 1997	3	G.B. Mottesi
970923.1	<i>Lepomis aurtius</i>	trib. of Simmon's Bay Creek	dirt drive off of SR 1930	Columbus	23 Sept. 1997	1	G.B. Mottesi
970923.1	<i>Lepomis gibbosus</i>	trib. of Simmon's Bay Creek	dirt drive off of SR 1930	Columbus	23 Sept. 1997	1	G.B. Mottesi
970923.2	<i>Aphredoderus sayanus</i>	trib. of Simmon's Bay Creek	SR 1932	Columbus	23 Sept. 1997	6	G.B. Mottesi
970923.2	<i>Centrarchus macropterus</i>	trib. of Simmon's Bay Creek	SR 1932	Columbus	23 Sept. 1997	7	G.B. Mottesi
970923.2	<i>Chaenobryttus gulosus</i>	trib. of Simmon's Bay Creek	SR 1932	Columbus	23 Sept. 1997	3	G.B. Mottesi
970923.2	<i>Enneacanthus gloriosus</i>	trib. of Simmon's Bay Creek	SR 1932	Columbus	23 Sept. 1997	1	G.B. Mottesi
970923.2	<i>Gambusia holbrooki</i>	trib. of Simmon's Bay Creek	SR 1932	Columbus	23 Sept. 1997	abundant	G.B. Mottesi
970923.2	<i>Lepomis gibbosus</i>	trib. of Simmon's Bay Creek	SR 1932	Columbus	23 Sept. 1997	1	G.B. Mottesi
970923.2	<i>Semotilus lumbee</i>	trib. of Simmon's Bay Creek	SR 1932	Columbus	23 Sept. 1997	1	G.B. Mottesi
970924.1	<i>Chaenobryttus gulosus</i>	Seven Creeks	NC 905	Columbus	24 Sept. 1997	2	G.B. Mottesi
970924.1	<i>Enneacanthus gloriosus</i>	Seven Creeks	NC 905	Columbus	24 Sept. 1997	1	G.B. Mottesi
970924.1	<i>Esox americanus</i>	Seven Creeks	NC 905	Columbus	24 Sept. 1997	1	G.B. Mottesi
970924.1	<i>Gambusia holbrooki</i>	Seven Creeks	NC 905	Columbus	24 Sept. 1997	abundant	G.B. Mottesi
970924.1	<i>Lepomis aurtius</i>	Seven Creeks	NC 905	Columbus	24 Sept. 1997	1	G.B. Mottesi

Table 2. Fish found in Lake Waccamaw State Park and associated waterways (cont.)

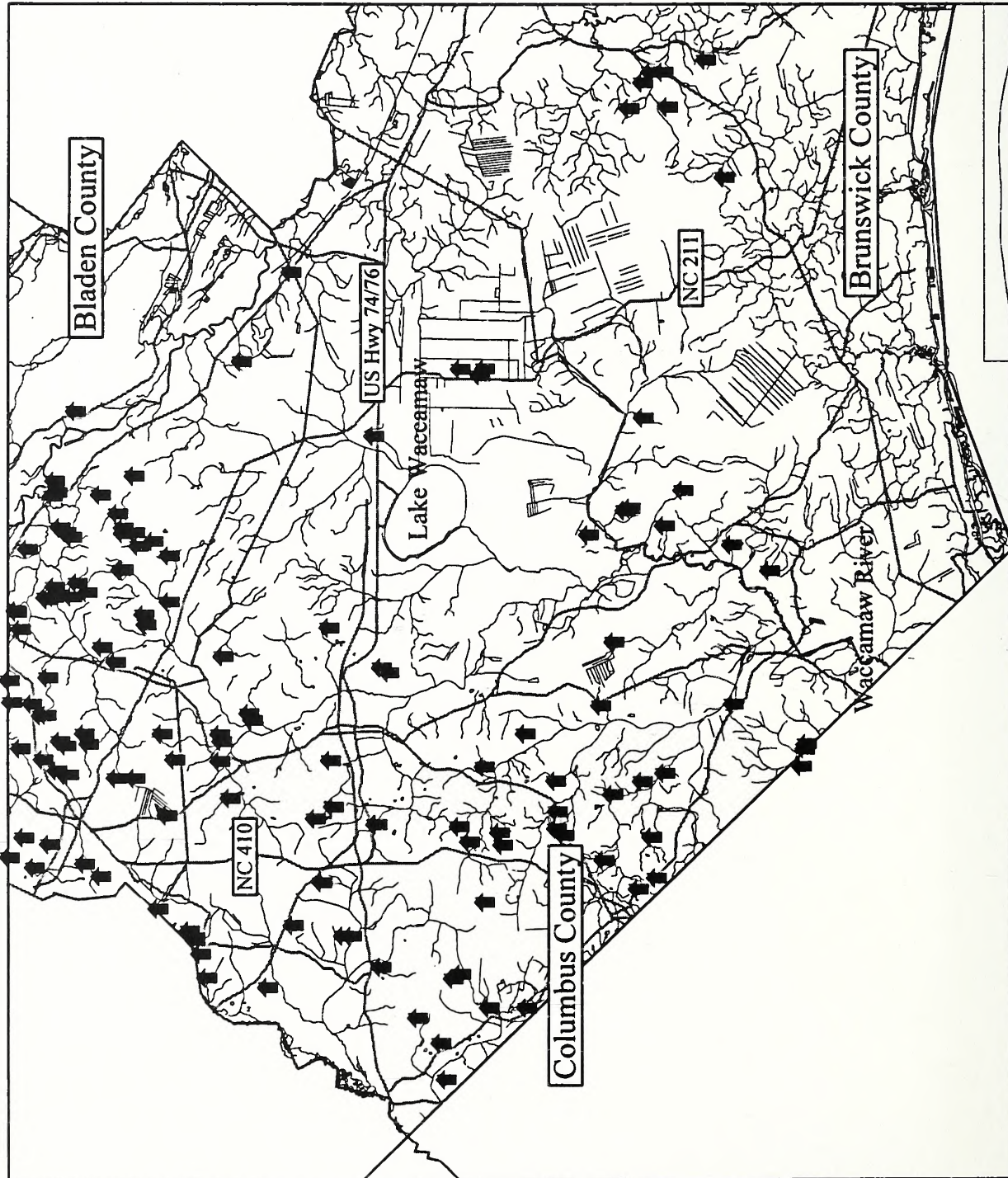
<u>Station No.</u>	<u>Scientific Name</u>	<u>Waterway</u>	<u>Common Locality</u>	<u>County</u>	<u>Date</u>	<u>No.</u>	<u>Identified By</u>
970924.1	<i>Lepomis gibbosus</i>	Seven Creeks	NC 905	Columbus	24 Sept. 1997	2	G.B. Mottesi
970924.2	<i>Gambusia holbrooki</i>	trib. of Waccamaw River	SR 1101	Columbus	24 Sept. 1997	4	G.B. Mottesi
970924.2	<i>Umbra pygmaea</i>	trib. of Waccamaw River	SR 1101	Columbus	24 Sept. 1997	2	G.B. Mottesi

Animal Facilities

The following map shows the animal facilities near and around the waterways associated with Lake Waccamaw State Park. This information was acquired from the Water Quality Section, Division of Environmental Management, North Carolina Department of Environment, Health, and Natural Resources.

LAKE WACCAMAW STATE PARK

ANIMAL FACILITIES



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